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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/829,709	04/10/2001	David L. Anglin	08935-240001 / M4931A	1782

26161 7590 05/07/2003

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EXAMINER
MERCADO, JULIAN A

ART UNIT	PAPER NUMBER
1745	9

DATE MAILED: 05/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-9

Office Action Summary	Application No.	Applicant(s)	
	09/829,709	ANGLIN, DAVID L.	
	Examiner	Art Unit	
	Julian A. Mercado	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-34 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-34 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 7 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the subject matter of claim 29 requires antecedent basis in the specification.

Claim Objections

Claim 29 is objected to because of the following informalities:

In claim 29 at line 1, "a group" requires changing to --the group-- in order to comply with proper Markush language.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 6-10, 16-19, 31, 32 and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Friend (EP 0 962 997 A1).

Regarding independent claims 1 and 31 and dependent claims thereto as noted hereafter, Friend is relied upon to teach the alleged inventive concept of carbon fibers in a manganese dioxide/alkaline battery having more than 5% of carbon fibers by weight. (p. 7, Sample No. 1 under Table II, calculated by the examiner at 5.15% by weight, applies to claim 1). The cathode active material, i.e. manganese dioxide is calculated at 52.6% which is less than "about 90%" or "about 88%) by weight. (applies to dependent claims 9, 10) The carbon fibers have a diameter less than or equal to 0.1 μm, i.e. 100 nm. (also applies to dependent claims 13-15, pg. 7 line 26, pg. 8 line 10) As to the limitation "the carbon fibers have been heat treated (claims 16-18), this process limitation has been interpreted to require a causal structural feature in the carbon fibers, i.e. "heat-treated carbon fibers" such as more properly recited in claim 34, and in this regard, Friend teaches heat-treated carbon fibers at temperatures of 680°C. (pg. 8 line 58, also applies to dependent claim 16) Length to diameter ratios are disclosed at at least 5, thus a length of 500 nm is anticipated. (pg. 8 line 10, applies to dependent claim 19)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-22, 24 and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi et al. (U.S. Pat. 4,923,637) in view of Kordesch et al. (U.S. Pat. 5,011,752).

Regarding independent claims 1 and 31 and dependent claims thereto as noted hereafter, Yagi is relied upon to teach the alleged inventive concept of carbon fibers in a battery having an average diameter of 50 nanometers up to 2 microns; in a specific example, fibers from 100 nanometers to 500 nanometers are disclosed. (col. 4 line 1 and line 60-65, col. 11 line 7, also applies to dependent claims 13-15) The extent to which the disclosed ranges of carbon fibers in Yagi overlap with applicant's claimed ranges are relied upon to teach or at least suggest a diameter of "less than about 300 nanometers" (claim 13), "between about 100 nanometers and about 250 nanometers (claim 14), and "less than about 250 nanometers" (claim 15). Yagi teaches carbon fiber lengths of 10 to 1000 μm, i.e. 10,000 to 1,000,000 nanometers. (col. 4 line 65 applies to dependent claims 19 and 20) Thus, the extent to which the disclosed lengths of carbon fibers in Yagi overlap with applicant's claimed range are relied upon to teach or at least suggest a carbon fiber length of "less than about 2×10^5 nanometers" (claim 19), "between about 500 nanometers and about 200,000 nanometers" (claim 20), and "between about 70,000 nanometers and about 100,000 nanometers" (claim 21), additionally, the extent to which the resulting external surface area of the carbon fibers in Yagi based on the disclosed average length and diameter thereof is relied upon to teach or at least suggest the claimed "external surface area between about $10 m^2/g$ and about 50 m^2/g. (applies to dependent claim 24). The carbon fiber has at least one layer of graphite, more so a plurality of layers of graphite. (col. 3 line 64, applies to dependent claim 22) As to the limitation "the carbon fibers have been heat treated (claims 16-18), this process limitation has been interpreted to require a causal structural feature in the carbon fibers, i.e. "heat-treated carbon fibers" such as more properly recited in claim 34, and in

this regard, Yagi teaches heat-treated carbon fibers at temperatures of 2000°C to 3500°C. (col. 4 line 13, also applies to dependent claims 16-18)

As cited above, Yagi specifically teaches that the carbon fibers are useable as an electrically conducting material in a battery. While the components of a battery are not explicitly disclosed by Yagi, Kordesch teaches an alkaline battery employing carbon in the form of graphite and graphite fibers, the fibers being present at more than 5% by weight (col. 11 line 59-60, applies to independent claims 1 and 31 and dependent claims 2-7, and 32-34 thereto). The battery comprises an anode of zinc and a cathode material of manganese dioxide present at 84.14% (col. 8 line 11 and line 17, applies to dependent claim 8 and 30), thus teaching the instant manganese dioxide at less than 90% (dependent claim 9), less than 88% (dependent claim 10), between about 82% and about 92% (dependent claim 11), and between about 84% and about 90% (dependent claim 12), with all of these disclosed ranges by weight. Thus, at the time the invention was made, it would have been obvious to one of ordinary skill in the art to employ Yagi's carbon fibers in Kordesch's battery as Yagi specifically suggests that the carbon fibers are useable as electrically conducting material and because Yagi's carbon fibers enhance the intercalation properties of the formed carbon fiber compound, e.g. the cathode composition in Kordesch's invention.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi in view of Kordesch et al. as applied to claims 1-22 and 31-33 above, and further in view of Lafdi and Wright. (Carbon Fibers from Handbook of Composites, 1998)

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi in view of Kordesch et al. as applied to claims 1-22, 24 and 31-33 above, and further in view of Singer (U.S. Pat. 4,005,183)

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi in view of Kordesch et al. as applied to claims 1-22, 24 and 31-33 above, and further in view of Lafdi and Wright and Singer.

The teachings of Yagi and Kordesch are discussed above. The rejection of claims 23, 26 and 34 when further in view of the teachings of Lafdi or Singer will be discussed in parallel.

Yagi does not explicitly teach carbon fibers to have between about 40 to about 100 layers of graphite (claim 23) or a graphitic index of less than about 85% (claim 26). However, absent of unexpected results it is asserted that the number of layers in a carbon fiber, and the graphitic index, i.e. degree of graphitization, is each an optimizable parameter for a corresponding result-effective variable. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) The number of layers of a carbon fiber are considered to be a result-effective variable as the "layer planes" of graphite crystallites directly effects the mechanical properties of the carbon fibers such as its tensile modulus and tensile strength, *inter alia.* (Lafdi, p. 44 under "Effect of Graphite Structure on Fiber Properties") The graphitic index is considered to be a result-effective variable as the graphite orientation of carbon fibers directly effects "graphitic-like" properties such as high density and low electrical resistance. (Singer, col. 11 line 43 to col. 14 line 53)

As to the electrical conductivity of the carbon fiber in the cathode (as claimed at more than 5% by weight) being at least 3 times greater than a cathode having about 6% of graphite by weight, the skilled artisan would find obvious that relative to non-fibrous graphite, carbon fibers have a higher degree of electrical conductivity. (Singer as cited above, Lafdi at p. 185 line 5 et seq.) As to the degree of conductivity being three times that of graphite, absent of unexpected results it is asserted that the degree of conductivity is an optimizable parameter for a result-effective variable such as battery efficiency due to internal heat loss. *In re Boesch*

Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi in view of Kordesch et al. as applied to claims 1-22 and 31-33 above, and further in view of Glasgow et al. (U.S. Pat. 6,506,355)

The teachings of Yagi and Kordesch are discussed above.

Yagi does not explicitly teach the carbon fibers to have a surface area between about $10m^2/g$ and about 50 m^2/g or a surface energy between about 50 mJ/m^2 and about 300 mJ/m^2. However, the extent to which the disclosed ranges of surface area and surface energies in Glasgow overlap with applicant's claimed ranges are relied upon to teach surface areas and surface energies for carbon fibers within this range. (col. 2 line 44 et seq., see also col. 1 line 60, applies to dependent claim 25) Thus, the skilled artisan would find obvious to employ surface areas and surface energies within the instant range for reasons such as enhancing the adherence of the fibers within its compositional application.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi in view of Kordesch et al. as applied to claims 1-22, 24 and 31-33 above, and further in view of Mototani et al. (U.S. Pat. 5, 482,798)

The teachings of Yagi and Kordesch are discussed above.

Yagi does not explicitly teach the average length of the carbon fibers equal to or greater than the average particle size of the cathode active material. However, Mototani teaches that the average particle size of the active is preferably equal to the particle size of carbon. (col. 3 line 40-59, also see col. 1 line 37-45 in reference to a prior art disclosure) Thus, the skilled artisan would find obvious without undue experimentation to employ the carbon fiber length or particle size of Yagi's invention equal to the particle size cathode active material in the battery. The motivation for such a modification would be to allow for optimal battery capacity and electrical conductivity.

Claims 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi in view of Kordesch et al. as applied to claims 1-22 and 31-33 above, and further in view of applicant's admitted prior art. (Chalilpoyil et al. U.S. Pat. 4,777,100)

The teachings of Yagi and Kordesch are discussed above.

The examiner relies on Chalilpoyil as cited by applicant to teach a surfactant in the cathode. (col. 2 line 3-32) Thus, the skilled artisan would find obvious to employ a surfactant in the battery of Yagi for reasons such as cell corrosion prevention.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi, Kordesch et al., and Chalilpoyil et al. as applied to claim 28 above, and further in view of Callahan et al. (U.S. Pat. 6,287,730 B1)

The teachings of Yagi, Kordesch and Chalilpoyil are discussed above.

Callahan is relied upon to teach a surfactant such as EVOH, i.e. ethylene vinyl alcohol. (col. 1 line 38-41)) The skilled artisan would find obvious to further modify Yagi's invention by employing ethylene vinyl alcohol as a surfactant for reasons such as increasing the surface energies of the battery components (anode, cathode and separator, as disclosed in Kordesch and Chalilpoyil) and thereby further increasing anode metal particle affinity and enhancing the formed hydrogen gas inhibiting coating.

Conclusion

Of Information Disclosure Statements (IDS) entered as paper Nos. 6 and 7, only paper No. 7 (filed July 15, 2002) is present in the file with copies of the cited references. Applicant is requested to submit the cited references in paper No. 6, upon which the examiner will consider these cited references in full. IDS paper Nos. 3 and 5 (filed June 4, 2001 and April 10, 2001, respectively) appear to be missing from the file entirely; applicant is requested to re-submit Form PTO 1449 and the accompanying cited documents.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julian A. Mercado whose telephone number is (703) 305-0511. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

jam
May 3, 2003

Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700